UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

December 29, 2015

Mr. Anthony R. Brown
Environmental Manager
Atlantic Richfield Company
4 Centerpointe Drive, LPR 4-435
La Palma, CA 90623-1066

Re: E PA comments on Atlantic Richfield's April 23, 2016 Mine Waste Technical Data Summary Report, Leviathan Mine Site, Alpine County, California

Dear Mr. Brown,

EPA has completed its review of Atlantic Richfield Company's (ARC) April 23, 2016 Mine Waste Technical Data Summary Report (TDSR), Leviathan Mine Site, Alpine County, California. This work is being performed pursuant to the Administrative Order for Remedial Investigation and Feasibility Study, Leviathan Mine, Alpine County, California (CERCLA Docket No. 2008-18, June 23, 2008).

Background:

This report summarizes the status of ongoing work completed under Amendment No. 6 to the August 10, 2010 On Property Focused Remedial Investigation Work Plan. ARC provided Phase 1 Amendment No. 6 on June 7, 2013. EPA issued a partial approval of Amendment No. 6 dated August 8, 2013 requesting continued analysis of material from each sample point via X-Ray Fluorescence. EP A also expressed concerns with the lack of spatial analysis, and lack of a relationship of decision units to human health and ecological risk assessment scenarios. Decisio n units and incremental sampling were subsequently abandoned by ARC in favor of discrete sampling, and spatial analysis has been undertaken by ARC.

EPA and ARC held discussions related to mine waste characterization on August 29, 2013, and February 10, 2014. Atlantic Richfield provided the Amendment No 6. Revision 1 to the On Property FRI work plan on June 4, 2014. The revision described a sampling approach based on results of earlier sampling conducted in a subset of the Overburden Area north of the Pit during 2012. On November 4, 2014 EPA provided an email request that Atlantic Richfield proceed with the Phase II Mine Waste Characterization field work, and to provide a formal response and an updated work plan to complete the site file records.

On November 28, 2014, ARC provided the Final Task Sampling and Analysis Plan for Phase 2 Mine Waste Characterization (TSAP). On April 3, 2015. EPA comments noted that the response addressed all but two of EPA's November 4, 2014 comments and clearl y directed Atlantic Richfield to begin to compile data report summaries and interpretations to support completion of the remedial investigation and feasibility study (RIFS) at Leviathan Mine. EPA provided an outline and a due date of May 1, 2015.

ARC responded in a letter dated May 1, 2015:

- ARC a greed that a data evaluation report is needed to confirm that the data collection effort is sufficient for RI/FS purposes and satisfies the applicable DQOs.
- ARC asked for additional time to review and present the data. ARC stated they could not be ready with a report for the scheduled quarterly technical meeting in June. ARC suggested presenting the information at the next meeting in September. EPA requested a separate webinar be scheduled at the earliest convenience.

On August 18, 2015 ARC provided a webinar. EPA requested a cop y of the slides and suggested an annotated outline for submittal of a mine waste data evaluation report. EPA also discussed the importance of keeping the risk assessments inclusive as part of the RI Report, and proposed a tentative time frame for preparation of the Mine Waste Data Evaluation.

On September 15, 2015 ARC transmitted the slides shared during the webinar, and included an annotated outline for mine waste technical memorandum, discussed separation of risk assessments from the RI Report, and proposed a tentative time frame for preparation of the Mine Waste Technical Memorandum.

On January 19, 2016 ARC and EPA held additional discussions of technical data deliverables such as the Mine Waste Technical Data Summary Report that are expected to become incorporated into the RI/FS report as appendices and provide the basis for RI/FS content. EPA was clear that the webinar presentation on August 8, 2015, and the subsequent deliverable were incomplete and did not address many of the April 3, 2015 comments.

On February 16, 2016 ARC requested an extension of the Mine Waste TDSR delivery date to April 16, 2016.

Beginning on April 3, 2015 EPA has requested a complete and robust technical report. ARC provided a revised Mine Waste TDSR on April 23, 2016. EPA has completed its review and provides the following remaining outstanding comments:

- **EPA previous comment S4: Section 4 Mine Waste Characterization Methods and Results:** Please explicitly link the decision statements defined by the DQOs during the planning process to the investigation methods that were used. Please include a full discussion on meeting the DQO's. For example, describe what data gaps the Aerial Photography and Mapping address and what data gaps the Borehole Sampling and Analysis address. Please provide a table to summarize and simplify a comparison to DQOs. **ARC February 16, 2016 Response:** ARC stated that information would be added to Sections 4.0 and 7.0 of the report to address this comment. **EPA Comment:** The requested information is provided but is not explicitly linked as requested in EPA's comment. EPA directs ARC to provide the requested text describing in detail how the RI data address the DQOs.

- **EPA previous comment S5: Section 6 Evaluation of the Nature and Extent of Contamination:** The annotation for Section 6 ends with an emphasis on use of data to illustrate the extent of mine waste. While the extent of mine waste is of interest, of equal interest is the extent of the chemicals of concern that originate in mine waste. Please ensure that a section of the mine waste report identifies the extent of the chemicals of concern that originate from mine waste. **ARC February 16, 2016 Response:** ARC committed to address this request within Section 6.0 of the TDSR with the caveat that 'all hazardous substances originating from mine waste in all locations… have come to be located' was not the intent of

EPA's comment. **EPA Comment:** Many of the metals results that exceed benchmarks or proxy reference concentrations are not bounded laterally and sampling was based on visual evidence of overburden. EPA directs ARC to provide a discussion of lateral extent of contamination and how this will be addressed in the Feasibility Study and/or during remedial investigation/design. If additional data gap sampling is necessary, this should occur during the 2017 field season.

EPA provides the following new general and specific comments.

General Comments

- **G1: Section 3.0 Summary of previous investigations and abatement measures:** The summaries are general in nature and do not provide sufficient summary of available analytical data for mine waste. Please ensure that associated analytical data are summarized in tables to support comparison with information gathered during ARC's RI field efforts. It is important that ARC provide context for the RI data, evaluate site conditions through time, and provide support for decision making.

- **G2: Section 4.1.3 Secondary Sources and Pathways:** Please provide additional detail and discussion on the relationships of the secondary sources and pathways to mine waste. Mine waste is mentioned in the text; however, the focus of the text appears to be on each of the respective pathways. The text needs to be revised to state more clearly how the mine waste is related to the pathways.

- **G3: Section 5.3, Data Quality Assessment (DQA) Incomplete:** Please revise to ensure proper organization and documentation of the actual steps of the DQA as per the approved 2016 RI/FS QAPP. The QAPP, Section 6.1, clearly references EPA's Data Quality Assessment: A Reviewer's Guide EPA QA/G-9R, dated February 2006. It defines the 5 steps for performing a DQA:

    1. review project objectives and sampling design
    2. conduct preliminary data review
    3. select statistical method
    4. verify assumptions of the method
    5. draw conclusions from the data.

  However, ARC's Section 5.3 of the Mine Waste Report references the 1992 EPA document, Guidance for Data Usability in Risk Assessment, which includes a different set of criteria.

  The data quality review is not complete. Additional general and specific comments on the Mine Waste TDSR DQA are provided in Attachment 1 to these comments.

  In particular, the TDSR does not show how the DQA and DQO processes correlate. ARC must ensure compliance with EPA guidance, and provide a clear DQO process that includes a sampling design that collects the right type, quality, and quantity of data for the intended use. Please provide revised DQA text statements to clearly support the adequacy and sufficiency of the data set to support the risk assessments and RI/FS decision making. Please ensure that the DQA process evaluates whether the objectives in the DQO planning phase have been achieved and are supported by data of adequate quality.

- **G4: Non-Conservative Screening**. In many instances ARC used the maximum proxy reference metal concentration to screen the mine waste data sets. This results in a non-conservative comparison because

there is no way to determine if an outlier is responsible for the selected screening value. Please estimate the median and/or mean concentration prox y reference concentration for each metal and provide comparison to median and/or mean site concentrations. These will likely be more similar to the calculated exposure point concentrations (EPC's) developed in Section 8 of the report, to represent an upper confidence limit on the mean concentration. Additional details are provided in the specific comments below

- **G5: Lack of Documentation to Support Statistical Analyses:** ARC must ensure that statistical analysis is clearly documented and presented. ARC's attempts to confirm statistical analyses through reference to appendices is not sufficient. In some cases, the appendix is overly general and does not clearly show how or whether the information supports the text (i.e. the geostatistical cross validation) The statistical power analysis (Section 5.4.6 and 6.2.1.4) is not included in an appendix and the findings are not reproducible using the methods described in the text. Please ensure that proper statistical analysis is provided to support the report conclusions. Additional details are provided in the specific comments below.

- **G6: Link Enabled Table of Contents**: All future TSDR reports must ensure the pdf have go to links enabled in the Table of Contents and text for Sections Table and Figure. This will make the 800 plus pages of report easier for the reviewer. Check out this link for direction http://blogs.adobe.com/acrolaw/2011/03/ensuring-that-word-tocs-create-hyperlinks-in-acrobat/

Specific Comments

- **S1: Page ES-6: Conclusions Bullet 3:** Please update reference comparisons with RI reference data as available.

- **S2: Section 4.1.3.2 Surface Water, third paragraph:** The text refers to an 'acidic pond discussed above', however a review of the preceding text did not find such a discussion. The relationship of the beaver pond discussion to the mine waste should be explicitly stated so that the discussion becomes relevant to the memorandum. Alternatively, this paragraph could be deleted with no loss of clarity in the document.

- **S3: Section 4.1.3.2 Surface Water, fourth paragraph:** This paragraph introduces the topics of storm water runoff and snowmelt. However, the discussion remains general in that runoff interactions with mine waste is not clear. Please revise the text to focus on the interactions of mine waste and storm water, and mine waste and snow melt.

- **S4: Section 4.3.4 Step 4 Define Boundaries, Target Population:** Typically the upper 10 feet is evaluated for a residential receptor. Please revise the text to include the upper 10 feet or indicate that the calculated EPCs are conservatively estimated to reflect the 10-foot interval.

- **S5: Section 5.4.1 Exploratory Data Analysis:** The current discussion does not offer explanation concerning the analyses being used for the cross validation assessment. In Appendix 5-F the results of cross validation are presented in raw form. Please provide a more complete description of the analyses used in cross validation statistics, and include more explicit indication of what is being presented and the results of the cross validation. The text should include discussion of the results and concerns of the cross validation statistics and implications for geostatistical models.

- **S6: Section 6.1 Location, Extent, and Volume of Mine Waste, first paragraph:** The text notes that in situ rock exposed by excavation of the open pit was evaluated as mine waste. It is not clear from subsequent discussion how this evaluation affected the estimation of mine waste volume. Please revise the text to identify the volume of in situ rock exposed in the pit and considered as mine waste, and to separately identify the volume of mine waste resulting from movement of materials during mining.

- **S7: Figure 5-1:** The area disturbed to create the miners housing north of the Aspen Seep area is not identified as mine waste. The ground surface was disturbed and geologic materials were significantly redistributed in this area during mining. Please include this area in any estimate of the mine waste, revise Figure 5-1, and ensure that the estimated volume of mine waste includes this material.

- **S8: Figure 6-1:** The figure is not very useful. Labeling some site features would be helpful, however, the scale of the presented figure does not support its intended use. Please show separate areas (such as the overburden area, and the upper pond area, and the Delta Slope area, and the Pit) at a scale permitting discernment of relevant features (such as the bottom of the mine waste, surface of mine waste, roads, ponds, and topography).

- **S9: Section 6.2.1.3 Phase 2 Multivariate Principal Component Analysis Results:** ARC does not provide a comprehensive summary of the data used for the assessment. Please list the variables used to form the principle components. In addition, please provide the variance of F1 and F2 on the accompanying graphs. EPA also notes and requests explanation for the presence of beryllium twice on the graphs. Please revise Paragraph 2 in Section 6.2.1.3 to discuss the PCA groupings in more depth and cat text to discuss what the results appear to indicate about the data. The text currently offers broad assessment with no discussion of relevance to the site.

- **S10: Section 6.2.1 Surficial Sampling Results:** This section discusses results from statistical analyses individually. While this is necessary, please also include an additional subsection (i.e. Section 6.2.1.5) that summarizes the individual statistical results in context with other statistical evaluations.

- **S11: Section 6.2.1.4 Preliminary Statistical Power Assessment Results:** The text here requires significant revision. The text does not identify the method(s) used to complete the power analysis, does not identify software used or refer to such a description, and no example figures or explanatory text are provided. The text simply states that the power analysis showed that a sufficient number of samples were collected. The information provided in Section 5.4.6 does not meet these requirements. Attempts to use ProUCL software and the data set provided with the TDSR met with ambiguous results that were not consistent with the existing text. ARC should use ProUCL or other statistical analysis program. At a minimum the text needs to be augmented with a description of how the analysis was completed, a summary table that identifies the inputs used to conduct the power analysis, and representative graphs providing examples of the analysis.

- **S12: Section 6.3 and Table 8-12. Evaluation of Grain Size on Metal Concentrations**. EPA notes the total number of 24 samples are from actually from 14 locations. And these 14 locations are to represent 230 acres of mine waste. The statistical evaluation and resulting conclusions may not represent the actual enrichment factors. Please add text to discuss this limitation in the uncertainty section of the baseline risk assessment. EPA also notes new guidance July 1, 2016: *Recommendations for Sieving Soil and Dust Samples at Lead Sites for Assessment of Incidental Ingestion*. The memo

recommends moving from the current < 250 µm particle size to < 150 µm particle size. The recommendation is based upon an expanding body of evidence illustrating that dermally adhered soil is dominated by particle fractions < 150 µm. Please consider this in the preparation of the risk assessment.

- **S13: Section 6.4.1.1 Macronutrients:** The discussion of Phosphorus states that the phosphorous measurements in mine waste samples could be misleading. The text should be revised to give an idea of how the results are misleading and state whether the phosphorous concentrations in mine waste are likely biased high or low.

- **S14: Section 6.4.2.2 Neutralization Potential** : The current discussion is misleading and should be revised to accurately reflect the available information. The text improperly quotes the results of Herbst and Sciacca (1982). Herbst and Sciacca observed calcite "along joint faces in the biotite pyroxene hornblende andesite, coating pebbles in the sedimentary unit cut by a fault on the west edge of the pit, and along plant roots in soil developed on sandstone". These descriptions are of in-place material not the contents of the waste rock and overburden piles. This text should be removed from the description and the discussion should be focused on the neutralization potential of the mine waste (waste rock and overburden).

- **S15: Section 6.4.2.3 Sulfur Analyses:** The discussion implies that there may be an increase in sulfide sulfur with depth (decrease in sulfate sulfur with depth). However, the information is presented without differentiation of shallow and deeper samples. This general presentation may mask an important characteristic of the mine waste piles (i.e. presence of an oxidized 'rind'). Please revise the text to show whether or not there is a variation of sulfide sulfur and/or sulfate sulfur with depth.\

- **S16: Section 7.1 Reconciliation with DQOs, last paragraph** : The text includes description of proxy levels as being the higher of two values, risk based screening levels and the maximum value from the proxy reference data set. Using the maximum concentration from the proxy reference data set is likely to result in a non-conservative screening result. This is because there may be outliers in the proxy data set or other factors that make the maximum value inappropriate for use in risk screening. Estimating the median and/or mean value of the proxy reference data set would be a simple exercise and result in a more conservative screen. EPA directs ARC to explain how selecting the maximum proxy reference concentration will avoid using outlier values as a screening tool; and to assess other factors that may impact use of the proxy reference values for screening. EPA also requests that the median and/or mean proxy reference concentrations be estimated for comparison with the site data.

- **S17: Table 7-1:** The text in Section 7.1 states that Table 1 provides a column that indicates what data gaps were addressed by each data collection activity. However, this column is not provided in Table 7-1. Please revise to include this column.

- **S18: Section 8.1 Risk Assessment Data Set:** The third bullet states that samples from 2 to 6 feet bgs are collected to assess risks to burrowing mammals. EPA notes that these data may also be used to assess risk to future construction workers at the site.

- **S19: Table 8-1:** This table compares only the minimum and maximum values detected to risk based screening benchmarks. As is, the table provides screening based on comparison of maximum concentrations from only one sample, resulting in a skewed perspective of the data. Please revise to also include the median and/or mean detected concentration for each metal, and provide the human health and ecological exposure point concentrations for comparison with the screening levels for each

metal.

- **S20: Section 8.2.2 Proxy Reference Area Concentrations:** The text states that the maximum proxy reference concentration from among six different proxy data sets was selected as a proxy reference comparison value. This is not a conservative approach to consideration of the proxy reference data. As is, a single outlier could significantly affect these comparisons. EPA directs ARC to estimate the median and/or mean concentration for each of the proxy reference metals and to include comparison of the median and/or mean proxy reference concentration for each metal with the site metal concentrations.

- **S21: Table 8-4:** The table provides an incomplete summary of proxy reference information. EPA directs ARC to complete the table by providing the median and/or mean metal concentrations for each of the proxy data sets, and the overall median and/or mean of the combined proxy data sets. This will provide for a more robust comparison with site data, and with the future Leviathan Mine reference data set.

- **S22: Human Health Comparison to Screening Levels:** The comparison is limited to the maximum detected concentration of each of the metals with screening benchmarks. This is overly conservative. EPA directs ARC to also include comparison of the median and/or mean detected concentration and estimated EPC of each of the metals with screening benchmarks.

- **S23: Table 8-5:** The table identifies a concentration used for screening. The footnote states that the maximum concentration was used for screening purposes. Use of the maximum concentration is very conservative. In addition to the maximum concentrations, EPA directs ARC to also compare the median and/or mean concentration for each metal to the screening benchmarks, and to include the EPCs for comparison as well.

- **S24: Section 8.2.3.3 Proxy Reference Concentrations and Table 8-8:** As-is the table combines overly conservative (through use of maximum detected values from the site) with non-conservative (through use of maximum proxy reference values) comparisons. This appears to lead to ambiguous screening results. For example, metals not detected in the proxy reference data and detected in site samples are not shown as exceeding the proxy reference values (for example chromium and silver). Further, for those metals such as cobalt, with maximum site concentrations less than the maximum proxy reference concentration, there is no way to determine if this is an effect of outliers in the data sets. EPA directs ARC to include the median and/or mean concentrations for each metal in the table for comparison, and to revise the text to reflect comparison of the median and/or mean concentrations in addition to the use of maximum concentrations.

- **S25: Section 8.3 Identification of Chemicals of Potential Concern:** The text notes that "Although the maximum concentration of several metals was below the proxy reference concentration, these criteria will be re-evaluated once the complete reference data set is available". This non-conservative conclusion was formed through use of the maximum detected concentrations from the proxy reference data to conduct screening. Unfortunately, there is no way to determine if outlier values have skewed the comparison using the information as presented. Therefore, EPA directs ARC to include the median and/or mean concentrations for site and proxy reference metals data in these comparisons and to revise all associated text accordingly.

- **S26: Section 8.3.1 Human Health Risk Assessment:** the text should be revised with respect to any

conclusions related to screening as noted in comment S22 above. In addition, the last sentence states that "If these metals are present below reference concentrations then the y will not be considered COPCs in the BHHRA". EPA has consistentl y stated that reference comparisons will not result in removal of chemicals from consideration in the risk assessment. All metals will be retained in the risk assessment and cumulative site risks will be determined to support decision makings

- **S27: Section 8.4.1.1 Human Health Receptors and Exposure Pathways:** The text presumes that the presence of the existin g fence at the site limits human exposure to site trespassers. This is not a permanent remed y under CERCLA. Also, this presumption does not consider the disturbed area location outside of the fenced area north of the Aspen Seep area. This area was graded during minin g to provide access for exploration drilling, and to provide housin g for contract miners emplo yed at the site. Currentl y there is no restriction on human access to this area. The text should be revised as necessary to address unrestricted access to this area.

- **S28: Section 8.4.3.1 Human Health Receptors (third paragraph on Page 83):** The text states that a hot spot analysis would occur if the mine waste does not pose an unacceptable risk (human or ecological). Please provide a graphical anal ysis of the outliers should to determine if hot spots are present (regardless of the overall risk) to ensure that some limited area of the mine waste does not pose a risk. Please complete and provide a hot spot evaluation.

- **S29: Conclusions:** The second paragraph begins with a statement that "Based on the evaluation of mine waste investigation data provided herein, the R I/FS data adequatel y characterize the mine waste materials for the purpose of the R I, human and ecological risk assessments, and the FS." This statement indicates that data qualit y and objectives have been met such that the risk assessment for Mine Waste can be completed. EPA requests completion of the baseline risk assessment for mine waste. Please develop concurrent with the remaining media specific reports, to ensure deliver y of inclusive *draft* RI/FS by December 31, 2017 and a complete and *final* RI/FS by August 30, 2018.

- **S30: Conclusions Page 86, Third Bullet:** The bullet describes special associations of two metal groups. The associations are referred to as having local or short range vs regional or long range scales of spatial variation. Please ensure that the scale of variation is described in terms of measurable lengths.

- **S31: Conclusions Page 87, Fourth Bullet:** The bullet text discusses prox y reference concentrations and identifies metals that were below the prox y reference concentrations. As described in comments above, the prox y reference concentrations were not selected appropriatel y. The maximum detected concentration of each metal was chosen as the prox y reference concentration. The comparison with prox y reference concentrations should be reevaluated using the median and/or mean prox y metal concentrations.

  The bullet text also suggests that if reference and site concentrations are similar, that the metal ma y not be site related. This is an inaccurate statement. A more accurate statement is that site and prox y risks are expected to be similar for those metals with similar site and prox y reference concentrations. Please revise the text accordingl y.

- **S32: Conclusions Page 87, Fifth Bullet:** Please ensure that use of the maximum concentration for screening is augmented with median and/or mean concentration, or a specified upper confidence limit on the mean. This will allow a more complete understanding of the data set and prevent overl y

conservative reactions to the data. Use of the maximum detected concentration ma y result in unnecessary attention to an outlier or other non- representative data point. Please ensure the screenin g comparisons are expanded to include the median and/or mean concentration.

- **S33: Conclusions Page 88, Second Bullet:** The last sentence refers to the 'entire mine waste pile'. The text should be changed to read 'entire mine waste area' **.**

- **S34: Recommendations:** The recommendations do not refer to the feasibilit y study. Please include a discussion of the feasibilit y study and include identification of preliminary remedial action objectives and preliminar y remedial action goals for mine waste at Leviathan Mine.

EPA attaches a copy of comments from the Lahontan Regional Water Qualit y Control Board dated November 10, 2016 and directs ARC to provide line b y line responses to each of the comments, including:

1. **General comments –** How will data gaps related to Isbell Camp be addressed?
2. **General comments –** How will hot spots be addressed in this work plan for certain areas that have considerably higher concentrations than the mine waste in general? Hot spots with potential public access should be addressed separatel y per CERCLA guidance. The area near the Isbell Camp area that had a concentration of arsenic of 5526 m g/kg should be investigated as a hot spot. Wh y were the areas that had the highest arsenic concentrations from Phase 1 sampling not revisited during Phase 2 sampling?
3. **Page 16, Section 4.1.2.1, first full paragraph on page, second to last sentence** – It is unclear what the term "mechanicall y derived sediment in surface water" means. Please clarif y.
4. **Page 56, Section 6.2.1.3** – The linkage between metals groupings and the importance related to the Principal Component Anal ysis is missing in this section. It is unclear what the difference from the left-hand and right-hand side of the correlation circles represents and how the scales of spatial variation were determined. Please clarif y.
6. **Page 67, Section 6.4.1.7, entire section, and Page 87, Section 9, first bullet on page** – The first paragraph of Section 6.4.1.7 discusses that there are previous studies documenting aluminum concentrations that could limit plant growth. Later in the third paragraph of this section, there is a statement that concentrations from borehole data indicate 11 metals have the potential to be ph ytotoxic, which includes aluminum. However, in Section 9, the bullet summarizes that "there appears to be no specific micro-nutrient metal concentrations that might cause ph ytotoxic effects on revegetation efforts at the site" and there is no mention of aluminum. It is unclear what is supporting this conclusion in li ght of the previous statements, and the conclusion could be misleading. Please clarif y.
7. **Page 82, Section 8.4.2.1** – Please explain the basis for the conclusion that human receptors could not be exposed to the maximum concentration of all COPCs and the assumption that the y would be exposed to average conditions throughout. Does this mean that there are no instances where a human receptor could be exposed to a maximum concentration of COPCs?

9. **Page 83, Section 8.4.3.1, second paragraph and Table 8-13** – It appears that an evaluation was conducted on the ten highest concentrations of each metal to determine if the y could be considered outliers. For seven metals it was determined that the top 10 concentrations were outliers of which some outliers were 10 times the representative concentration. Please explain how these higher concentrations were determined to be outliers versus hot spots. This data should be carefull y evaluated to ensure that valid high concentration data points are not inadvertentl y removed. Are the same 10 outliers identified

for the seven metals from the same sample locations? The sample locations for these potential outliers should be identified and illustrated in this document.

10. **Page 83, Section 8.4.3.1, third paragraph** – Why is further analysis only recommended for hot spot areas if the risk analysis does not indicate potential human health risks greater than acceptable levels? There are areas that appeared to be hot spots durin g Phase 1 sampling that were not sampled during Phase 2. If these areas are more likel y to be accessed by humans, it may be appropriate or necessary to conduct additional hot spot samplin g to evaluate exposure separatel y for certain areas. Please explain the basis for this determination.
11. **Appendix 5-C, Appendix 5-F, and Appendix 5-G –** It appears that there is missing information in these appendices. The variograms do not include what metal is being modeled, there are no descriptions to assist the reader in understanding what is being shown (such as in Appendix 6-A, page 534 of 803 or slide 31 of October 2, 2014 presentation), and there are no ranges specified on an y of the variograms.
12. **Appendix 5-H** – It appears that there is missing information in this appendix. It is not clear what metal is displayed in the cross validation plots and the information that is being displa yed is not defined in a manner to understand the importance of this anal ysis.

EPA also attaches a copy of comments from the Washoe Tribe of Nevada and California, dated November 1, 2016 and directs ARC to provide line b y line responses to each of the comments, including:

- **General Comment 1:** The Tribe concurs with BP's overall recommendation:
  Based on the evaluation of the mine waste investigation results described in this report, no additional characterization activities are recommended to satisfy the requirements of the RI. (Page 89)
  The Tribe generall y agrees with the conclusions that the wastes are essentiall y homogeneously heterogeneous and will need to be addressed via remedial action. Regardless, ex cept for understandin g the concentrations of COC in soils associated with the "halo", our comments do not support more sampling on-site.

- **General Comment 6**: The document includes a large amount of technical calculations that cannot be easil y evaluated or reproduced without the supportin g spreadsheets. Please provide the supporting spreadsheets and di gitall y stored data.

- **Specific comment: Page ES-2; 3. DATA EVALUATION FOR RISK ASSESSMENT:** A risk assessment data set for mine waste was compiled for comparison to human health and ecological risk-based screening levels and proxy reference concentrations to assess potential impacts associated with exposures to mine waste at the Leviathan Mine Site. Exposure scenarios, receptors, and data evaluation units (exposure areas) were identified for the purpose of developing exposure point concentrations for use in the human health and ecological risk assessments. Screens are suppose (sic) to be designed to provide conservative estimates. The Screening criteria described here are not conservative and do not provide nearly the requisite protection for members of the Tribe or the General Public. See General Comment No.3.

- **Specific comment 3: Page ES-4, First full paragraph, last sentence** : Data usabilit y assessments indicated that mine waste investigation data meet the requirements of the DQOs developed during planning of mine waste investigations. Clearl y the data do not meet the data usabilit y requirements following EPA 1992 approach; however, as described in General Comment No. 1, PR B will be the

basis of the remedial action objective (or preliminar y remediation goal)— risk will not be the cleanup driver. However, if COCs sampled in purported "reference areas" are biased-hi gh, and approach those concentrations observed for the Site, statistical discrimination between Site materials and PRB could require fairly extensive sampling.

- **Specific comment 4: Page ES-4, First full paragraph, last bullet:**
  • Based on visual examination of spatial distribution maps, the distribution of R I/FS metals across the mine waste is highl y variable resulting in considerable heterogeneit y in RI/FS metals concentrations are not consistent among all the metals and change significantl y within hundreds of feet. As a result, spatial trends in R I/FS metals concentrations are not apparent and were evaluated using geostatistical techniques to assess possible spatial relationships. The heterogeneit y in RI/FS metal concentrations within mine water materials is consistent with the random distribution of mine waste associated with the reported lack of coordinated plan for the placement of overburden and waste rock durin g mining activities.

  Throughout the document, BP essentiall y conclude that the subset of TA L metals measured in waste piles are so inter-mixed that the y can be considered nearl y homogeneously-heterogeneous over the scale of the Mined Area (MA), which is consistent with our interpretations provided in General Comment 1. However, BP also concludes that a subgroup of COCs is associated with longer, more regional range (second bullet, below).

  • Evaluation of spatial associations between various metals in mine waste samples suggests the presence of two groupings of metals. The first group includes aluminum ber yllium, cobalt, manganese, nickel, and zinc. This group of metals tends to be associated with local scales of spatial variation – or short-range spatial variations in metal distributions. The second group consists of antimon y, arsenic, barium, lead, mercur y, lead, selenium, and, silver. This group of metals tends to associate with regional scales of spatial variation – or long-range spatial variations in metal distributions.

  The Tribe is concerned that BP will attempt to ascribe the apparent spatial co-variance observed for this group to regional background. This conclusion is hard to believe especiall y since the degree of mechanical mixing that has occurred via mining and wasterock/overburden placement.

- **Specific comment Page ES-6, bullet 2:** Concentrations of metals were different in the fine soil fraction (less than 0.25 millimeter [mm]) compared to the concentrations in bulk samples, which includes both the fine and coarse fractions. Because human receptors are more likel y to be exposed to the fine fraction of soil particles which are more likel y to adhere to the skin or be resuspended in air, the 95% upper confidence limits (UC Ls) to be used for human health risk calculations were adjusted to represent fine fraction concentrations based on chemical-specific regressions. The Tribe generall y agrees with this approach; however, 250um is likel y too large. For human ingestion, the less than 62 um is the sand/silt cutoff on the Wentworth grain size classification scale. This siz e fraction is more easily consumed unknowingly by the receptor. The 250um is sand sized and even children are like to reject food containing soil of this size fraction. See also EPA comment S12 above.

- **Specific comment 7: Page ES-6, bullet 4:** Maximum concentrations of 16 R I/FS metals in soil 0 to 2 feet bgs exceed human health screening levels (HHS Ls) for residential site use. The maximum concentration of chromium, nickel, silver, and zinc were below the human health screening levels for residential site use. BP cannot screen out an y COC at this time. Residential HHS Ls are determine for a single COC, single pathwa y, originating from a sin gle medium. In this case soil to the exclusion of

risk from ingestion of Surfacewater or Groundwater.

- **Specific comment 9: Page ES-6, bullet 6:** Potential human exposure to mine waste is anticipated to occur over a large area which is not limited b y fences, property boundaries, or structures. Metals concentrations vary by metal throughout the mine waste area with some metals hi gher in one area and other metals higher in another area. A human receptor could not be exposed to the higher concentrations of one metal in one area and higher concentrations of another metal in another area simultaneously. Rather they are considered to move throughout the mine waste area so over time the y are exposed to average conditions throu ghout. As a result, the mine waste area is considered a single exposure area for residential receptors and exposure point concentrations (EPCs) were developed for the entire mine waste pile. Perhaps, but like ecological receptors, Tribal citizens will spend more time in specific area than another depending on whether the y are hunting, fishing, gathering, or just residing….

- **Specific comment 11: Entire Section 2.0 Geology** BP spends a lot of time on the regional geology, but just skims over the site-specific geolog y. Site-scale geology should be the focus for the site characterization report.

- **Specific comment 20: Page 31; Section INFORMATION GATHERING AND INTERPRETATION** Atlantic Richfield's mine waste investigation data collection program consisted of extent and texture mapping, discrete soil sampling from boreholes, and discrete and composite sampling from shallow hand dug locations. The discrete and composite samples likel y have different scales of geostatistical support and should not necessaril y be treated as similar specimens unless it can be shown that support is similar. Please provide this anal ysis.

- **Specific comment 21: Page 31; Section 5.1.1 Methods; first sentence** Extent mapping was conducted by walking select areas of the mine waste and making notations of the extent of mine waste on field maps. The "extent" described above appears to be the visual extent of contamination. The buffer or halo surrounding the edge of these piles where COCs have been released and transported away from the visual extent is likel y much larger and will need to be considered during the FS.

- **Specific comment 26: Page 40-41 entire section 5.2.3.2 Sample Analysis;** The Tribe has alwa ys been a proponent of sieving solid samples prior to anal yses for the following reasons:
  1. the thermodynamic effective concentration (TEC) of COCs are in part a function of the exposed surface area of the solid of stud y. The surface area available for chemical reaction is a function of the grain-size. Therefore, chemicall y analyzing samples that have been sieved better approximate the concentrations that are available to do chemical work.
  2. The 250 um is still too large. 62 um is preferred (See Specific comment 5), and
  3. 250um will be required to run the IEUBK mode for risk from Pb.
     See Also EPA comment S12 above.

  From the statement: *The fine fraction was analyzed for RI/FS metals. Depending on the sample material, for some samples there was insufficient sample volume to run both bulk and the fine-fraction analyses.* It is clear that field samplers were targetin g coarser materials (since not enou gh fines to do fines and coarser). This approach will not be helpful in the future when sampling occurs in the halo area as well as downstream from the MA.

- **Specific comment 27: Page 42 section 5.3.2 Documentation; last bullet:** Mercury and hexavalent

chromium were not analyzed in 23 additional bulk mine waste samples because insufficient soil was available for both bulk and fine fraction (grain size less than 0.25 mm) was required for anal yses. Almost 300 mine waste samples were available for hex avalent ***chromium and considered adequate to characterize mine waste***. [Emphasis added]. Please provide the Test Adequac y analysis. Note the quantitative criteria is not listed in the DQO section.

- **Specific comment 29: Page 46; First full paragraph; last sentence** In general, results of the statistical power anal ysis indicate that the Phase 2 Mine Waste samplin g program collected sufficient number of samples to service statistical h ypothesis tests relevant to the DQOs for mine waste investigation
  (Appendix 4-A) The results of the statistical power assessment are detailed in Section 6.2.1.4.
  It is not clear wh y BP is generalizin g/summarizing findings in section 5.0 and pushing off technical analysis until later in the doc. Also this summar y is not true and is not supported b y statements made in Section 8

- **Specific comment 31: Page 48; 5.4.5 Multivariate Principal Component Analysis; first paragraph; second sentence.** In theory, metals and other measured ph ysical properties that are grouped together are interpreted to originate from the same ph ysical source or undergo similar in situ physical and chemical processes. This ma y be true for a natural deposit; however, the concentration of COCs observed toda y are a consequence of the followin g and may have little ph ysico-chemical meaning:

  1. Initial natural variabilit y of the deposit, wasterock, overburden, and natural soils/bedrock
  2. time-dependent man-made variabilit y introduced by excavation and placement histor y
  3. time-dependent variabilit y introduced by leaching and transport, and
  4. variabilit y introduced by sampling design (grid size, support, REV, etc.).

  Regardless, the PCA was not instrumental to the conclusions.

- **Specific comment 33: Page 54; second full paragraph; second sentence:** Eighteen of the 20 R I/FS metals for the 0- to 0.5-foot bgs depth and 17 of the 20 metals for the 1.5- to 2.0-foot b gs depth exhibit a range value greater than 400 feet thereb y indicating that the ***Phase 2 sampling design was overall adequate for: 1) capturing the spatial heterogeneity of metal distributions for these sampling depths and 2) collecting an adequate sample number to service the statistical hypothesis testing detailed in the DQOs for the mine waste investigation.*** [Emphasis added] The conclusion regarding adequacy are incorrect—the y do not meet the DQOs for all of the TA L metals. This was anticipated in the Tribe's comments on the workplan for both Phases I and II. Also note the ranges are not reported b y particle-size cutoff---these could result in shorter ranges. In summar y, BP did not acquire enough specimens that contain the most variable COC. This is required to enable discrimination between unaffected (PRB) and affected populations.

- **Specific comment 34: Page 58: Second full paragraph; last sentence:** Results of the statistical hypotheses tests evaluatin g differences in metals concentrations with depth are provided in Appendix 6-D. In all cases, cannot reject the null due to poor statistical power (low n). The Tribe forewarned EPA/BP on this concern in comments on both Phase I and Phase II characteriz ation workplans.

- **Specific comment 43: Page 81; Section 8.4.1.1 Hu man Health Receptors and Exposure Pathways;**

Paragraph 1; Sentence 2: As described in Section 6.2.1.1, the variograms indicate that the soil has low variation over short distances (auto correlated), but becomes more heterogeneous over longer distances (on the order of less than 1,000 feet for most metals). The tables value of ranges is much shorter than the 1000 feet grid size. Some of which are shorter than 400 feet meaning that areas between the grid are still not characterized from COCs. Also some COCs do not meet the statistical power requirements described in EPA 1992.

On or before December 31, 2017, As part of a draft R I/FS submittal, please fully incorporate these EPA comments and prepare and submit a full complete and final robust Mine Waste Characterization chapter in the RI/FS report, and complete the baseline risk assessment for mine waste.

Please also at the same time, develop the remaining media specific reports (TDSRs) (i.e. surface water, groundwater, sediment/floodplain, and Reference) to be responsive and incorporate all of these same EPA comments. Please ensure delivery of those TDSRs are timed sufficient to allow for submittal of an inclusive *draft* RI/FS by December 31, 2017 and a complete and *final* RI/FS by August 30, 2018.

If you have any questions, please feel free to contact me at (415) 947-4183 or Deschambault.lynda@epa.gov.

Sincerely,

Lynda Deschambault
Remedial Project Manager

Cc by electronic Email:

Douglas Carey, California Regional Water Quality Control Board, Lahontan Region
Diane Vitals, Washoe Tribe of Nevada and California
David Friedman, Nevada Department of Environmental Protection
Kenneth Maas, United States Forest Service
Tom Maurer, United States Fish and Wildlife Service Toby McBride,
United States Fish and Wildlife Service Steve Hampton, California
Department of Fish and Wildlife Marc Lombardi, AMEC
Neil Mortimer, Washoe Tribe of Nevada and California

Attachment 1
Draft Mine Waste Technical Data Summary Report (TDSR) April 23, 2016
Section 5.3 Data Quality Assessment and Appendix 5-E – Data Quality Summary Worksheet

Compared findings to 2016 Revised RI/FS QAPP requirements for DQA, and EPA *Data Quality Assessment: A Reviewer's Guide EPA QA/G-9R*, February 2006

Section 5.3, Data Quality Assessment (DQA)

General Comment 1: As noted in our comments, EPA's 2006 guidance requires the following steps for performing a DQA:

1) review project objectives and sampling design
2) conduct preliminary data review
3) select statistical method
4) verify assumptions of the method
5) draw conclusions from the data.

General Comment 2: Section 5.3 text only provides a summary of the first activity in Step 2 of the 5 steps in the DQA process. The RI/FS QAPP provides a worksheet (Attachment 7 in QAPP) for reviewing the data quality, which was filled out and provided as Appendix 5-E. According to the Appendix 5-E worksheet, not all the 2011 and 2012 data has been validated; therefore, this data quality review is not complete.

Per the QAPP and EPA's DQA process, it is necessary to review other factors beyond laboratory analytical data and include the evaluation in the DQA, such as the sampling design, and statistical methods and graphs. This is not mentioned in the DQA section. Please ensure integration in the TSDR between the DQOs, the statistical methods, and the DQA. Section 7.1, Reconciliation with DQOs, is a continuation of the DQA process.

In Section 4.3.6, DQO Step-6-Specifiy Performance or Acceptance Criteria, the text indicates that a quantitative criteria will be evaluated prior to the comparison of data sets in statistical analyses and will include: (1) detectable concentrations of individual RI/FS metals in more than four samples in sample populations with less than 40 or more samples, (2) data set consists of 10 or more samples representative of a specific medium, and (3) data set represents a single population as determined by exploratory data analysis. The text explains that if these quantitative criteria are not met, a qualitative evaluation of the data set will be conducted, and the need for additional sample collection will be considered. Please ensure that this type of statistical comparison is discussed in the DQA section or clearly provide reference to the TDSR, Section 7.1, Reconciliation with DQOs.

Section 5.4, Data Interpretation methods, discusses various models and data analysis methods and also refers the reader to Section 6.0, Mine Waste Characterization, for other traditional data interpretation methods. Please first reference the DQO steps, without that, it is unclear if these methods are being used to provide the type of statistical analysis described in DQO Step 6.

ARC sometimes provides DQO references throughout Section 5.4 and in Section 6.2. The fourth paragraph of Section

5.4.1 states, "In general, results of the statistical power analysis indicate that the Phase 2 Mine Waste sampling program collected sufficient number of samples to service statistical hypothesis test relevant to the DQOs for mine waste investigation." Also, in Section 6.2.1.2, Phase 2 Variogram and Stochastic Interpolation Results, second paragraph, ARC explains "…. the Phase 2 sampling design was overall adequate for: 1) capturing the spatial heterogeneity of metal distributions for these sampling depths and 2) collecting an adequate sample number to service the statistical hypothesis testing detailed in the DQOs for the mine waste investigation." Please provide sufficient detail, to ensure that these statements are easily correlated with the DQO Step 6 criteria, explained in Section 4.3.6.

General Comment 3: The information in Section 5.3 lacks logical presentation, meaningful to the DQA process. Please revise the DQA section to correspond to the QAPP/ EPA's DQA steps, with references to the appropriate section in the TSDR that complete this DQA process. Furthermore, as written now, each subsection provides excerpts of data quality review information with no apparent rationale for inclusion. Please see the following specific comments for examples.

- **Specific Comment 1: Section 5.3.1 Reports.** The purpose of this section is out of context and unclear. Please ensure adherence with the approved QAPP. Also, please clarify, integrate, or delete the four sentences explaining items related to data
    - RI/FS metals data were generated by ARC according to FRI sampling plans based on a specific sampling design at specific locations;
    - methods and detection limits were documented in the annual reports;
    - metal concentrations reported between reporting limit and method detection limit were estimated; and
    - metals reported as non-detected were less than the reporting limit.

- **Specific Comment 2: Section 5.3.2 Documentation.** Please ensure the discussion of missing data is included in a section describing the completeness goal. This section begins explaining that samples were collected in accordance with FRI sampling plans, and using chain of custody records and standard operating procedures. Then the text describes a few changes from the proposed sampling plan, which included discussion of insufficient sample volume for bulk and fine fractions and insufficient soil for mercury and hexavalent chromium. Rather than discuss together here, please include in the completeness goal.

- **Specific Comment 3: Section 5.3.3 Data Sources.** This section is not necessary, it provides a very brief discussion of how many samples were collected, which was already discussed earlier in detail in Section 5.2.

- **Specific Comment 4: Section 5.3.4 Analytical Methods and Detection Limits.** This section explains that methods and reporting limits were consistent with the QAPP. And then goes on to discusses frequency of metals detection. It is unclear why frequency is relevant. The text also explains that reporting limits were increased based on conditions specific to a sample. This is a common occurrence due to sample matrix interference or concentrations outside the calibration range that require dilution of the sample and is reviewed during data validation. Therefore, it is not necessary to explain this concept – this would be discussed in the QCSR or data validation reports. Then the text also explains that reporting limits were lower in surficial mine waste data than borehole data, but met the required screening levels. It is unclear why this is mentioned and how to interpret this information. Why were the reporting limits different? Were they elevated in the borehole data due to dilutions or matrix interference? If this is an important concept or deviation from QAPP, then more explanation is needed. Otherwise this issue would be addressed in the QCSR or data validation reports.

- **Specific Comment 5: Section 5.3.5 Data Quality Indicators:** The last paragraph does not entirely commit to a specific conclusion about whether the data quality meets the project's data quality indicators.
  The text states *"Overall, the data quality for the RI/FS mine waste data were found to be adequate such that the data can be used for quantitative evaluation."* However, the text then continues with this statement, *"The specific exceptions noted for the data described herein will be considered as conclusions about the data are made."*
  Please remove reference to future conclusions about the data. The conclusion about the quality of the data is the purpose of this report, and should be made herein.

  Furthermore, the specific exceptions referenced include two bullets, one is a discussion of rejected data and the other is a discussion of data that is qualified as estimated. Rejected data cannot be used for evaluation; therefore, there is no reason to consider this data at some future time. In addition, qualified estimated data should be available for the intended use. Once the data is validated and appropriate data qualifiers (and usability codes) are added to the database, with any necessary adjustments to the reporting limits (such as for blank contamination), then the data should support the intended use. There is no reason for ARC to postpone this evaluation, once the validation and verification step has been completed and documented in the QCSRs and this data quality summary.
  If the data quality is still in question, then provide text to describe appropriate corrective action should be taken i.e. please clarify if ARC finds it necessary to collect additional samples or review the validation findings again, and explain that here in this text.

Appendix 5-E, Data Quality Summary Worksheet

- **Specific Comment 6: Assessment Question "Summarize the effect of field sampling issues on data usability, if applicable," page 5 of 20.** The ARC response provides two bullets that do not adequately explain the issue and how data is impacted. The first bullet states that Phase 1 mine waste samples that were sieved are not comparable to mine waste samples submitted for laboratory analysis. Please include text to explain why the data is not comparable, and how the data for either type of sample is to be utilized. The second bullet states that Phase 2 mine waste samples were tested on a bulk basis and a subset was also sieved and borehole mine waste samples were tested on a bulk basis. Please include text to explain what this difference means for utilizing the data or comparing data.

- **Specific Comment 7: Assessment Question "Accuracy – How were matrix difficulties handled?"** Information was provided for 2014, 2012, and 2011. Please include 2013.

- **Specific Comment 8: Assessment of Completeness.** ARC may have inconsistently or incorrectly calculated and documented the completeness goal. According to the QAPP, completeness is the amount of valid data obtained compared to the amount that was expected under ideal conditions. Missing data that contribute to lack of completeness includes planned samples that were not collected, or not analyzed, as well as rejected data.

  However, the Appendix 5-E Data Quality Summary Worksheet, last assessment question (Was completeness goal met for the data?) refers to Table 5E-4 for summary of completeness. Table 5E-4 is a summary of the percentage of data points that are qualified based on the type of qualifier (i.e. estimated, rejected, or by various laboratory

qualifiers). This summary table does not portray completeness. How data is qualified, is irrelevant unless it is rejected. Rejected data or data that is not collected as planned due to a field issue would count towards the completeness goal. Note also, that the Appendix 5-E worksheet, on page 9 of 20 the question is asked whether there are problems associated with data completeness and the response provided describes percentages of completeness that do not match the information on Table 5E-4. Please include text to clarify how completeness is evaluated, ensure it is consistently calculated using the same methodology, and reported correctly the worksheet and tables.